1972

Achievement and Retention in the Audio-Tutorial Program Versus the Traditional Program

Rose Anna Swanson
Eastern Illinois University

PAPER CERTIFICATE #2

TO: Graduate Degree Candidates who have written formal theses.

SUBJECT: Permission to reproduce theses.

The University Library is receiving a number of requests from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow theses to be copied.

Please sign one of the following statements.

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

May 23, 1972
Date

I respectfully request Booth Library of Eastern Illinois University not allow my thesis be reproduced because _____

_____

_____

_____ _____

Date Author

Achievement and Retention in the Audio-Tutorial Program versus the Traditional Program

(TITLE)

BY

Rose Anna Swanson

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1972
YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

May 24, 1972
DATE

24 May 72
DATE

ABSTRACT

During Fall Quarter, 1970, 339 students enrolled in life science taught by the audio-tutorial method and 492 students in life science by the traditional method at Eastern Illinois University. This total population was compared with respect to achievement as measured by grades. A sample of 175 students was drawn from the population. The 76 audio-tutorial students were compared with the 99 students from traditional sections with respect to achievement as measured by grades earned, retention of material, and predicted grade point average.

The study was designed: 1) To compare the achievement in life science as measured by grades of those students who had been taught by the audio-tutorial method with those who had been taught by the traditional method. 2) To compare the success as measured by grades earned of the students who had life science by the audio-tutorial method with those who had life science by the traditional method in their subsequent biological courses. 3) To compare the retention as measured by the CLEP Test of material from these courses between the two groups.

Predicted grade point average was used to equate and evaluate grades and retention scores.

Data collected from the entire population of students indicated that students taught by the audio-tutorial method

earned significantly higher grades in life science than those taught by the traditional method. A comparison of grades earned in subsequent biological courses showed no differences.

A comparison of the two teaching methods indicated that the achievement level of students taught by the audio-tutorial method in life science as measured by retention did significantly better than those taught by the traditional method.

Comparisons of achievement as measured by retention showed that audio-tutorial students surpassed the regular students from the traditional method in all categories except that in which life science, botany and zoology were considered inclusively. Differences were not significant except in the latter.

ACKNOWLEDGEMENTS

The author wishes to express her appreciation and thanks to Dr. P.J. Docter for his assistance and guidance throughout the course of this research. To Drs. Durham, Keppler and Riegel, the author extends her appreciation for their review of the manuscript.

The author wishes to thank Miss Linda Rucker and Miss Elizabeth Shaw for their assistance in contacting the students involved in this study.

INTRODUCTION

In the past few years, schools have been trying different teaching techniques. One of these is the "audio-tutorial" technique. Since the start of the audio-tutorial method of instruction in 1961, many schools from the elementary to university level have installed audio-tutorial programs in the classroom.

There have been many studies made on the audio-tutorial method. These studies have been mainly concerned with the variations which can be incorporated into the teaching by the audio-tutorial method. Others have studied the effect of attendance. Today with the budgetary problems encountered by most schools, the studies have been on the cost of the aduio-tutorial method and variations which can be made to cut the initial cost.

To date, few studies have been made that quantitatively evaluate the success of the students taught by the audio-tutorial method. Based on the literature available on audio-tutorial programs, more quantitative data are needed to objectively evaluate the effectiveness of audio-tutorial systems.

This study is designed: 1) To compare the achievement of those students who had taken life science by the audio-tutorial method with those students who had taken life science by the traditional method. 2) To compare the

success of the students who had life science by the audio-tutorial method with those who had life science by the traditional method in their subsequent biological courses.

LITERATURE REVIEW

The audio-tutorial method of teaching was started in 1961 by S. N. Postlethwait at Purdue University. In an attempt to help poorer academic students, Postlethwait taped supplementary lectures for students. Later, diagrams and posters were added to supplement the lectures, and finally the student was asked to follow explanations of portions of the text. By the end of the semester the material provided was so complete, the student was not required to attend the formal class sessions. The reaction of the students was so favorable that the course was restructured and was employed for use by all the students. The course was structured to provide for a maximum of student freedom for independent study, and adjustments were made for the interests, background, and capacity of the student (Postlethwait, Novak, and Murray, Jr., 1969).

The audio-tutorial system places an emphasis on independent student learning. The teacher identifies the objectives to be learned by the students, and they learn at their own pace. The voice on the tape is to direct and supplement the students' learning (Postlethwait, et al., 1969).

Russell, (1968) did a study in an introductory biology course comparing the audio-tutorial method with the conventional method of teaching in two junior colleges in Texas. He compared a control group, 187 students,

and an experimental, audio-tutorial group, of 233 students, on overall achievement, sex differences, placement by ACT scores on achievement, the effect of successful completion of three high school science courses on achievement, and successful completion of one of the versions of BSCS on achievement. He also did comparative studies on the attitudes of the students. This study used 67 vectors to test the hypotheses. Russell found that there were no significant differences in any of these hypotheses except in overall achievement where the control group surpassed the experimental group, and the females surpassed the males in achievement.

Meleca, (1970) tested 91 students at Syracuse University in a general biology course. He had 48 students in his experimental group and 43 students in his control group. Meleca used multivariate analysis in his evaluation of the audio-tutorial program. There were three objectives in the study 1) To determine what factors contributed to achievement in an audio-tutorial biology course, 2) To compare these factors with those contributing to achievement in a traditional course, and 3) To determine if there was a significant difference in achievement between the two groups. He found by using the paired T-test, that the audio-tutorial course was more effective than the traditional course if grades are accepted as a criterion to

measure the effectiveness of the program.

Ehrle, 1970, stated the misuses of the audio-tutorial method of instruction. The audio-tutorial method does not solve all educational problems. An inefficient course taught by audio-tutorial is still an inefficient course; it cannot be improved by installing audio-tutorial equipment. He emphasized the audio-tutorial system can be used to excellent educational advantages. The most important advantage is the teacher can be free to teach. This system allows the teacher to be the humanizing element and to teach the student as an individual (Ehrle, 1970).

Hinton, (1970) surveyed the junior colleges in California, using the audio-tutorial method for active instruction and those expecting to be using the audio-tutorial method in the next three to five years. Three of the questions from his study yield some generalized information pertinent to this study. One college (4%) felt that retention of material was worse using the audio-tutorial method than the traditional method. Seventy-six per cent of the respondents felt students, in the same amount of time, learned more by the audio-tutorial method. Grades were used as evidence. Hinton found that few comparisons have been made between the two teaching methods and that more data are needed on this point.

In his study, he found that students and teachers

found the audio-tutorial system is more individualized, personalized, efficient, effective, and economical. He also found that the audio-tutorial method is more convenient for students, is enjoyed by students, provides for the individual differences, and allows for self-pacing and repetition (Hinton, 1970).

Sparks and Unbehaun (1971) designed a study to objectively evaluate the achievement of students using the audio-tutorial program by comparing them with achievement of students using the traditional program. Their control group was composed of 180 students and the experimental group consisted of 190 students. Identical portions of examinations were given periodically from the Total Biology Test and were analyzed by the Z-Test statistic.

They found that students using the audio-tutorial method do achieve more than those using the traditional method (Sparks and Unbehaun, 1971).

MATERIALS AND METHODS

In Fall Quarter, 1970, 399 students took life science by the audio-tutorial method of instruction, and 492 students took life science by the traditional, lecture-lab, method at Eastern Illinois University in Charleston, Illinois. Students were assigned to the audio-tutorial sections or regular sections by computer scheduling. Unless there was a conflict in their class schedule, no changes could be made.

The audio-tutorial sections were taught following the Postlethwait (Postlethwait, et al., 1969) method except that no general assembly sessions were used after the first week. The students were free to spend as much time preparing for the week's unit as they needed. They would then meet at a specified time each week to take an oral and written quiz with ten students per section.

The traditional sections met for two hours of lecture and four hours of lab per week. This group was taught by different instructors with approximately thirty students per class. All of these instructors had no audio-tutorial teaching experience.

All of the audio-tutorial and traditional sections of life science were to follow a course outline prepared by a committee to standardize the life science course.

All of the students who had taken life science

fall, 1970, and also had taken another biological science course were contacted to meet at a specified time and place to fill out an attitude questionnaire. A number of the students could not be contacted for various reasons. Of those contacted, 76 students from audio-tutorial sections and 99 students from traditional sections appeared. They were given a standardized biology test and attitude questionnaire. The fact that the test was being given was not mentioned at the time the students were contacted. In this way, no preparation was anticipated, and retention of the material learned in the science courses could be more accurately evaluated.

Achievement was evaluated by comparing grades earned by the total population in the two methods of teaching life science, and by comparing grades earned in subsequent biological courses by the two groups. The same comparisons were made for those students who responded to the questionnaire. Grades were used as a criterion for evaluation of the courses, even though it is realized that grades were awarded differently by different instructors.

The specific test, Brief Test in Biology, which is part of the College Level Examination Program from the College Entrance Examination Board was used for testing retention. Retention was measured by comparing the scores from the CLEP Biology Test for the two groups. For the purposes of this study, this test was scored on the basis of material covered in the life science course only, material covered only in

Introductory Botany, and material covered only in Introductory Zoology. It was thus possible to make comparisons based on individuals with identical background as far as the biological science courses that they had had were concerned. For example, students in the control and experimental groups who had had only life science and Introductory Botany were compared. Students who had had only life science and Introductory Zoology in the control and experimental groups compared, etc.

The data were treated by using analysis of variance technique for comparison of the experimental and control groups. A prediction value for basic ability using regression weights was obtained for the 175 students contacted from the 1969-70 ACT Standard Research Service Report for Eastern Illinois University. This score was used to compare the two groups as to ability and what they achieved.

For purposes of clarity, the following terminology will be used throughout the balance of this study:

1). Population refers to all students who took life science fall, 1970. Of these 339 took it by the audio-tutorial method,and 492 students took it by the traditional method.

2.) Sample refers to the 175 students from the population who were studied.

3.) Experimental group refers to the 77 students who

had taken life science by the audio-tutorial method.

4.) Control group refers to the 99 students who had taken life science by the traditional method.

5.) Life Science subgroup refers to the students from the sample who had taken only life science.

6.) Life Science, botany subgroup refers to the students from the sample who had taken life science and botany.

7.) Life Science, zoology subgroup refers to the students who had taken life science and zoology.

8.) Life Science, botany, zoology subgroup refers to the students who had taken life science, botany and zoology.

RESULTS

There have been many arguments both pro and con on the audio-tutorial versus the traditional method.

Some of the arguments in favor of the audio-tutorial technique are individual help for the student, the organization of the material in small units, integration of lab, lecture, and films, multiple sensory input, possibility to repeat material, freedom to schedule his own time, and immediate feed back to the student.

The arguments against the audio-tutorial technique are loss of individuality, too easy for the student, too boring, too much "spoon feeding", and too highly organized.

It is not the purpose of this investigation to defend either method of teaching. The prime criterion in evaluating a teaching strategy is the performance of the students after exposure to that strategy. The purpose of this study was to see if performance of students taught with audio-tutorial techniques differed from those taught in a traditional manner.

Performance was measured by grades earned and by retention of knowledge as indicated by CLEP scores.

To test for a difference in achievement and retention, seven null hypotheses were established and analyzed by statistical tests.

Total Population:

Hypothesis 1: The achievement of the audio-tutorial

students as measured by grades was not significantly different from the achievement as measured by grades from students taught in traditional sections in life science.

The audio-tutorial students had a higher mean grade for life science than those taught in traditional sections (Table 1). This difference was significant at the 5 percent level (Table 2).

Result 1: Hypothesis rejected.

Hypothesis 2: The achievement of the audio-tutorial students as measured by grades was not significantly different from the students taught in traditional sections in subsequent diological courses.

The audio-tutorial students had a higher mean grade than the traditional students in botany and zoology, as shown in Table 1, but these differences were not statistically significantly different (Table 2).

Result 2: Hypothesis accepted.

Sample:

Hypothesis 1: The achievement in life science as measured by grades of the audio-tutorial group was not significantly different from the control group.

The audio-tutorial group had a higher mean grade in life science than the control group (Table 4). The difference in grades was not significant (Table 5).

Result 1: Hypothesis accepted.

Hypothesis 2: There was no difference in predicted grade point average between the experimental and control groups.

A comparison of prediction scores showed that the life science subgroup, the life science, botany subgroup, and the life science, botany, zoology subgroup were higher in the control group than their counterpart the experimental group (Table 3).

Result 2: Hypothesis accepted.

Hypothesis 3: There was no difference in retention of material from life science as measured by CLEP scores between the two groups after adjustment was made for the linear effect of the covariate, predicted grade point average.

The experimental group had a higher mean retention score than the control group (Table 6). This difference was significant at the 5 percent level (Table 7).

Result 3: Hypothesis rejected.

Hypothesis 4: There was no difference in retention of material as measured by CLEP scores in subsequent biological courses between the two groups after adjustment was made for the linear effect of the covariate, predicted grade point average.

Table 6 showed a trend for the experimental group to have a higher mean retention score for the life science, botany subgroup, and the life science, zoology subgroup. However, a test of hypothesis 4 showed that there was no statistically significant difference in the scores (Table 7).

A test of this hypothesis applied to the life science, botany, zoology subgroup showed significant differences at the 5 percent level (Table 7).

Result 4: Hypothesis accepted for life science, botany subgroup and life science, zoology subgroup. Hypothesis rejected for life science, botany, zoology subgroup.

Table 1. A comparison of all students enrolled in life science and who continued to botany and/or zoology

	GRADES*	
	Experimental Group	Control Group
Life Science		
Sample Size	339	492
Mean	2.8407[1]	2.4431
Standard Dev.	1.0843	1.0693
Botany		
Sample Size	175	216
Mean	2.6857	2.5046
Standard Dev.	0.9338	1.0477
Zoology		
Sample Size	178	253
Mean	2.5281	2.4269
Standard Dev.	1.0038	1.0726

*Grades based on 4.00 scale.

[1]Significant at 0.05 level.

Table 2. An analysis of variance summary table for grades of all students enrolled in life science and who continued to botany and/or zoology.

SUM OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F_{obs} RATIO	F_{exp} RATIO
Life Science					
Between Groups	31.7321	1	31.7321	27.4373	3.85
Within Groups	958.7644	829	1.1565		
Total	990.4963	830			
Botany					
Between Groups	3.1701	1	3.1701	3.1807	3.86
Within Groups	387.7075	389	0.9967		
Total	390.8774	390			
Zoology					
Between Groups	1.0703	1	1.0703	0.9806	3.86
Within Groups	468.2515	429	1.0915		
Total	469.3218	430			

Table 3. A comparison of predicted grade point average for success for the experimental and control groups in life science only and life science and/or botany and zoology

	Prediction Scores*	
	Experimental Group	Control Group
Life Science		
Sample Size	76	99
Mean	2.5460	2.6010
Standard Dev.	0.4103	0.4761
L.S. & Botany		
Sample Size	14	18
Mean	2.4286	2.5500
Standard Dev.	0.3574	0.5428
L.S. & Zoology		
Sample Size	25	38
Mean	2.6520	2.5868
Standard Dev.	0.4001	0.4514
L.S., Bot., & Zool.		
Sample Size	32	38
Mean	2.6031	2.6632
Standard Dev.	0.3686	0.4616

*Prediction scores based on 4.00 scale.

Table 4. A comparison of grades for students in life science, botany, and zoology for the experimental and control groups.

	GRADES *	
	Experimental Group	Control Group
Life Science		
Sample Size	76	99
Mean	3.1842	3.0404
Standard Dev.	0.8280	0.8797
Botany		
Sample Size	47	56
Mean	2.8936	3.0536
Standard Dev.	0.7293	0.7488
Zoology		
Sample Size	58	76
Mean	2.7241	2.8816
Standard Dev.	1.1207	0.9793

*Grades based on 4.00 scale.

Table 5. An analysis of variance summary table of grades for students in life science, botany, and zoology for the experimental and control groups contacted.

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F_{obs} RATIO	F_{exp} RATIO
Life Science					
Between Groups	0.8891	1	0.8891	1.2087	3.91
Within Groups	127.2583	173	0.7356		
Total	128.1474	174			
Botany					
Between Groups	0.6538	1	0.6538	1.1939	3.94
Within Groups	55.3070	101	0.5476		
Total	55.9608	102			
Zoology					
Between Groups	0.8154	1	0.8154	0.7499	3.92
Within Groups	143.5198	132	1.0873		
Total	144.3352	133			

Table 6. A comparison of CLEP scores for the experimental and control groups in life science only, and life science and/or botany and zoology.

	CLEP Scores	
	Experimental Group	Control Group
Life Science		
Sample Size	76	99
Mean	15.2105[1]	14.5050
Standard Dev.	4.1803	4.0967
L. S. & Botany		
Sample Size	14	18
Mean	16.9286	16.6667
Standard Dev.	2.4629	5.9535
L. S. & Zoology		
Sample Size	25	38
Mean	21.24	18.6579
Standard Dev.	7.1008	4.4913
L. S., Bot., & Zool.		
Sample Size	32	38
Mean	24.5313	25.60[1]
Standard Dev.	6.2298	7.0730

[1]Significant at 0.05 level.

Table 7. A data summary table for analysis of covariance* of CLEP scores for life science only and life science and/or botany and zoology

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F_{obs} RATIO	F_{exp} RATIO
Life Science					
Treatments	112.54	1	112.54		
Error	2342.02	174	13.46	8.36	3.89
Total	2454.56	175			
L.S. & Botany					
Treatments	11.27	1	11.27		
Error	453.21	30	15.11	0.7459	4.17
Total	464.48	31			
L.S. & Zoology					
Treatments	105.96	1	105.96		
Error	1653.91	61	27.11	3.9085	4.0
Total	1759.87	62			
L.S. Bot., & Zool,					
Treatments	190.88	1	190.88		
Error	2758.22	68	40.56	4.706	3.98
Total	2949.10	69			

*Prediction Score as Covariate

DISCUSSION

If asked, "Do students using an audio-tutorial system achieve as much or more as those using a traditional method of instruction?", the answer would be affirmative.

Based on the data obtained, the students in audio-tutorial sections surpassed the control group in achievement according to grades received in life science (Table 1). This was a significant difference. The higher achievement as a result of audio-tutorial instruction concurred with the findings of Meleca (1970), and Sparks and Unbehaun (1971), but contradicted those of Russell (1968).

The students from the audio-tutorial sections also had higher mean grades in subsequent biological courses than those from the control group, although the difference was not statistically significant (Tables 1, 2).

In the sample of 175 students tested for retention, the experimental group had earned higher mean grades in life science than the control group. The control group, however, surpassed the experimental group in grades earned in subsequent biological courses. Once again, these differences were not significant (Tables 4, 5).

Comparisons of predicted grade point averages showed that the control group predicted to have a higher grade point average than the experimental group in the life science subgroup, life science, botany subgroup, and life science, botany - zoology subgroup (Table 3). The experimental group

had a higher predicted grade point average in the life science, zoology subgroup than their counterpart. However, these differences were not significant (Table 5).

When retention of material learned was better, however, the experimental group showed a trend for higher retention when an adjustment was made for the covariate, predicted grade point average (Table 6).

Statistical tests on retention of material from life science one year after the courses was taken, showed that the experimental group had a significantly higher retention score (Table 6, 7).

The experimental group retained more in the life science, botany subgroup and the life science, zoology subgroup than the control group, but the differences were not significant (Tables 6, 7).

The control group that took life science, botany, zoology surpassed their audio-tutorial counterpart in retention scores. This difference was significant at the 5 percent level (Table 6, 7). In this subgroup composed of 38 students, seven were both honors program students and science majors. It is the feeling of the author that this could have introduced a bias into these retention scores. This bias did not show up in the total control group of 99 students because it was masked by the larger sample size.

CONCLUSIONS

The 339 audio-tutorial students did significantly better in achievement in life science as measured by grades earned than the 492 students taught by the traditional method. They also had higher mean grades in subsequent biology courses than the control group, but the difference was not significant.

In the sample group of 175 students, the control group had a higher mean prediction score in all the subgroups, except life science - zoology subgroup where the audio-tutorial group had a higher prediction score. However, achievement as measured by grades, was higher in life science in the audio-tutorial students than the control group. The control group had higher mean grades in subsequent biology courses than the audio-tutorial group, but the difference was not significant.

When a comparison of achievement in life science was measured by retention of material learned in life science, the audio-tutorial students did significantly better than the control group.

When a comparison of material was measured by retention scores in the life science, botany area, and the life science, zoology area, the audio-tutorial group had higher mean retention scores than the control group in these subgroups. However, the control group did significantly better in the life science, botany, zoology subgroup than the audio-

tutorial group when achievement of material was compared by retention scores.

LITERATURE CITED

Downie, N. M., and R. W. Heath. 1959. Basic Statistical Methods. Harper and Brothers, New York. 289 pp.

Ehrle, E. B. 1970. Avoiding the audio-tutorial mistake. BioScience, 20:103.

Hinton, J. R. 1970. Audio-Tutorial Practices in California Community Colleges. Research Office Diablo Valley College, Pleasant Hill, California.

Meleca, C. B. 1970. The use of multivariate analysis in the evaluation of audio-tutorial programs I and II. BioScience, 20:23-30.

Postlethwait, S. N. and J. Novak, and H. T. Murray, Jr. 1969. The Audio-Tutorial Approach to Learning. Burgess Publishing Co., Minneapolis, Minnesota.

Russell, W. B. 1968. Some comparisons of the audio-tutorial method with the conventional method in introductory biology. Doctoral Dissertation, North Texas State University.

Sparks, P. D. and L. M. Unbehaun. 1971. Achievement of audio-tutorial and conventional biology students, a comparative study. BioScience, 21:574-576.